For four days Texas A&M will be Texas Arts and Mathematics
Articles

Robert Longhurst: Arabesque 29. Nat Friedman

Basketball is an Octahedron: Intriguing Structures of Balls, Ergun Akleman

Two Americans in Paris: George Rickey and Kenneth Snelson, Claude Bruter

Space, Nat Friedman

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Article Submission

For inclusion in Hyperseeing, members of ISAMA are invited to email material for the preceding categories to hyperseeing@gmail.com

Note that articles should be a maximum of three pages.
Robert Longhurst is a sculptor who lives in Chestertown, NY about a 1½ hour drive north of Albany. I have known Bob for about fifteen years. He carves absolutely beautiful wood sculptures generally in Bubinga wood. These sculptures are extremely thin surfaces that often have hyperbolic geometry. The cover sculpture Arabesque 29 is an example. This sculpture is actually based on an Enneper’s Surface. The computer image of the usual position of an Enneper surface is shown below.

Bob has rotated the usual position ¼ turn counterclockwise to obtain the position in the center photo above. In this case the sculpture is mounted on a visible rod that is inserted into a thickened edge. If the sculpture in the center photo is rotated on the rod about a 1/8th turn to the right, the view in the right photo is obtained. Another 1/8th turn to the right will result in the view in the left photo, which is quite striking and would correspond to the Top view of the usual position. Another ¼ turn to the right will return to the center view. Thus ½ turn to the right returns the sculpture back to its initial view, which implies the sculpture has ½ turn symmetry from above. This can be seen in the computer image of the top view of Enneper’s surface corresponding to the above photos.

The top view has ½ turn rotational symmetry. This implies that for any front view, as in the above photos, the view is identical to the view directly opposite (1/2 way around). That is, if we consider any of the three photos as a front view, then the back view will be the same. Thus the half-turn symmetry of the top view helps to hypersee the sculpture. In particular, we only need to rotate the sculpture ½ turn on the rod to hypersee all the possible front views.

Note that the left photo has 1/3 turn rotational symmetry. This implies that rotating the Usual Position 1/3 turn horizontally results in hyperseeing the sculpture completely in the Usual Position. Additional photos of Longhurst sculptures can be seen at www.robertlonghurst.com. Computer images are from the excellent website rsp.math.brandeis.edu/3D-XplorMath/Surface/gallery_m.html.

Alfred Enneper is a German mathematician who earned his PhD from the Georg-August-Universität Göttingen in 1856 for his dissertation about functions with complex arguments. He studied minimal surfaces and parametrized Enneper’s minimal surfaces in 1863. A contemporary of Karl Weierstrass, the two created a whole class of parameterizations.

From Wikipedia
Each sport has its own easily identifiable ball. The major difference between the balls comes not from their sizes or colors but from their mesh structures. Each sport’s ball consists of a set of spherical polygons. For instance, the current mesh structure of a soccer ball is a spherical version of a truncated icosahedron that came from Buckminster Fuller’s famous geodesic dome designs. Soccer balls consist of 12 spherical pentagons and 20 spherical hexagons. At each vertex, three polygons meet. This particular design of a soccer ball was first marketed in the 1950’s and used in the 1970 world cup. Before the 1950’s, soccer balls were simply spherical versions of the football used in American Football. For a detailed history of soccer balls see www.soccerballworld.com/.

Good understanding of mesh structures of the balls is important for illustrators. Any student of illustration must learn geometry to be able to observe the structures that exist in nature. Unfortunately, geometry is not a subject that is taught in art schools. In fact, geometry is not even really taught in engineering schools. In 1978, I was a professional cartoonist for Girgir magazine and I was also an engineering student. I had already taken courses in calculus, linear algebra, ordinary and partial differential equations, discrete mathematics and even engineering drawing, but I did not know anything about platonic solids. I clearly remember that one week I had to draw a soccer ball for a cartoon. I knew that there had to be some pentagonal patches. That was all I knew. I drew a soccer ball but that soccer ball looked strange. The cartoon was published but I could not figure out what was wrong with my drawing. During my PhD on Computer Graphics, I had a minor in mathematics but none of the courses I took dealt with geometry. It is interesting that I learned geometry by myself when I worked on my thesis.

I first realized the importance of mesh structures of balls during our visit to Germany in the Summer 2004. We stayed with my wife’s sister. It was the time of the European Soccer Cup and as a rabid soccer fan I loved watching soccer every night with my brother in-law who was an amateur soccer coach. Naturally, in their backyard there were a wide variety of soccer balls. I realized that some of them were unusual. So, I took the photographs of these unusual soccer balls. A soccer ball in the backyard was particularly interesting to me as a researcher. In this soccer ball, the designers drew hexagons on the surfaces. Obviously, they thought that if they drew hexagons small enough, they can cover a sphere using only hexagons. Interestingly enough, I had just written a paper on pentagonal subdivision (a remeshing algorithm that can convert any given mesh to a pentagonal mesh) and showed that a pentagonal subdivision is the only one beyond quadrilateral and triangular subdivisions. Using the Euler-Poincare equation it is easy to prove that a hexagonal subdivision does not exist. In other words, it is not possible to cover a sphere with even non-regular hexagons regardless of how small they are. Ian Stewart had a very nice article on this subject. Obviously, the designers of that ball did not know
about it.

The most interesting soccer ball in the backyard was a hand-sewn dodecahedral ball. Although a dodecahedron is not as good approximation of a sphere as a truncated icosahedron, the sole existence of this ball suggested to me that the dodecahedral structure have been used for soccer balls until Buckminster Fuller’s design won over any other rival structure.

Another observation from the trip was the design of the official ball of the 2004 European Cup. Obviously, the designers of the ball wanted to make the ball more interesting and drew brush strokes that create an octahedral structure on the surface. They did not complete the triangles but the octahedral structure was clearly visible from the brush strokes. So, I wondered what are other mesh structures on the surfaces of balls that are used in sports.

When I returned back to the US, I started to look at other balls. A basketball turned out to be the most interesting one. Basketball was originally played with brown soccer balls. In the 1950’s, the legendary basketball coach Tony Hinkle invented the current orange ball to make it more visible to both players and spectators. The mesh structure of the current basketball turned out to be an octahedron. It consists of 8 identical spherical triangles and 4 triangles meet in each vertex. It is really hard to see these triangles. So, I cut an old basketball to see the shapes of triangles. As you can see in the images, each spherical triangle consists of two long and one short curved edges. Although, these triangles do not look aesthetic themselves, the basketball has its own beauty. So, this is a clear example of the whole being more than its parts.

Another interesting shape turned out to be the tennis ball. It is not known who designed the tennis ball, but, Charles Goodyear’s vulcanization process allowed mass production of rubber balls in the 1850’s. I do not know how similar those balls in the 1850’s were with today’s tennis balls. However, the current tennis ball consists of two spherical polygons drawn on the sphere as if they are 3D yin and yang symbols. I also cut a tennis ball to clearly see the shapes of these 3D yin and yang symbols. Since the ball is pressurized, it was very hard to cut it, but it is really worth it to see the shapes. A baseball shares the same mesh structure with the tennis ball.

On the other hand, a volleyball seems to be the most uninteresting ball. But, if you look at one carefully you will see 6 quadrilaterals and 12 hexagons. Can you find them? Note that you have to count the number of vertices to determine the type. This particular structure was briefly used in soccer balls before 1950. I could not find out the history of a volleyball but the current mesh structure of volleyballs must have been adapted from the early soccer balls.

Since a football is not spherical I do not call it a ball, but, there are many other balls. For instance, table tennis balls or billiard balls have only one surface and no edge. If you know any other sports ball with an interesting mesh structure, write to us.
At the bottom of the Avenue of the Opera, two steps away from the Louvre, along the Comédie Francaise, the Gardens of the Palais Royal presently welcome works by the eminent American sculptors George Rickey and Kenneth Snelson. George Rickey (1907-2002) is considered the leading modern kinetic sculptor and Kenneth Snelson (1927-) is the inventor of tensegrity sculpture. This exhibition was inaugurated on October 23, 2006 by the French Minister for Culture and Communication, Renaud Donnedieu de Vabres, and will close December 15, 2006. (All photographs by C.P.Bruter.)

That these sculptors are American expresses the current state of our global society whose movement is still influenced by the strong vitality of the nation of the star spangled banner. These are definitely works of the present time as seen in their design, material, and form. They are based on engineering principals and reflect a stage of the artistic evolution of humanity.

The sculptures of Rickey and Snelson both reflect a simplicity of basic forms. Rickey’s kinetic sculptures are based on rectangles moving with the wind. The movement is not frantic but rather slow and quite hypnotic. Rickey has constructed these kinetic sculptures so that they convey a wonderful choreography of simple geometric shapes. There is also the play of reflected light on the polished surfaces.

Snelson’s tensegrity sculptures consist of compositions of metal tubes individually suspended in space due to the tension on the connecting cables. When first seen, the constructions do not seem possible. Each
linear tube is like an individual musical note in space and the sculptures are compositions of these linear notes. Snelson displays both horizontal and vertical sculptures of impressive size.

The works of Rickey and Snelson are undoubtedly characteristic works of our time. They are impressive works that have evolved from ingenious fundamental ideas.

Kenneth Snelson’s website www.kennethsnelson.com is rich in information. In particular, the discussion in the section Structure and Tensegrity is excellent.
A major development of twentieth century sculpture was the introduction of space so that a sculpture became a composition of both form and space. Examples are works of Barbara Hepworth and Henry Moore. Actually form and space were appreciated much earlier in so-called Asian scholar’s rocks that were natural rocks found in rivers that had spaces carved out by the effects of time and water. In these sculptures the appreciation of the form-space compositions is mainly visual as the spaces are not large enough to enter. In particular, photographs can partially convey the visual experience of these sculptures.

There are two ways to appreciate a landscape form-space sculpture like the Grand Canyon. One way is to stand at the rim and appreciate it visually. A second way is to enter the canyon and move through it either by hiking or rafting. In this case there is the body experience of being in the canyon, as well as the visual experience. There are the same two ways of appreciating certain architectural sculpture.

The significance of large spaces that one can enter is of utmost importance in major contemporary sculpture. For example, Richard Serra’s torqued ellipses are large steel shells enclosing a space whose mathematical shape corresponds to an elliptical cross-section that rotates as the height of the cross-section increases. These are spaces that the observer can enter and walk around in and therefore experience the shape of the space. Thus the emphasis here is on the body experience of a mathematical space. Serra considers the visual experience of the steel shell as secondary to the body experience. Thus he does not feel that photographs can convey the main body experience of the torqued ellipses. Serra has also created sculptures that consist of long steel walls that one can walk between. These walls may be conical sections that lean in and out as well as sections with positive and negative curvature. Positive curvature corresponds to sections of spheres and negative curvature corresponds to sections of saddle shapes. Walking through the spaces between these walls can be a rather disorienting body experience. Thus appreciating these sculptural mathematical spaces is also mainly through body experience rather than visual experience. There is a permanent exhibit of eight of Serra’s sculptures, The Matter of Time, at the Guggenheim Art Museum in Bilbao, Spain, which will be visited during this years Bridges Donostia (see below). These sculptures are described as “gigantic exercises in topology”, The Guardian, June 22, 2005, Man of Steel, http://arts.guardian.co.uk/features/story/0,11710,1511714,00.html Also see the links at the end of the article.

There are also the space sculptures of Anish Kapoor that are huge topological spaces enclosed by shells of plastic fabric supported by cables. These are not spaces that one could walk through, although one can imagine being a bird and flying through them. A major example is Marsyas, 2002, constructed for the Turbine Hall at the Tate Modern, www.tate.org.uk/modern/exhibitions/kapoor/. Marsyas has round openings at each end, as well as a central opening that one could see...
into from a central viewing platform. The emphasis here was on the visual experience of the light in the space, as well as the extent of the shell form. Another example is Melancholia, which consists of a space with a circular opening at one end and a rectangular opening at the other end. This example is suggested by a mathematical string model in the British Science Museum in London, which consists of circle and square ends with equal numbers of holes through which string is threaded between the circle and the square. Thus one can see shapes that morph from a circle to a square. This mathematical model led Henry Moore and Barbara Hepworth to create string sculptures. Naum Gabo later developed quite refined string sculptures. Thus it is interesting that Anish Kapoor extended this mathematical idea to monumental size. A third example is Tarantantara, 1999, www.commissionsnorth.org/showcase/portfolio/102 which is a space with rectangular openings at each end. There are books available on Tarantantara and Marsyas, see Books section. ■
Due to the energy of Gary Greenfield, the art-math tribe now has the Journal of Mathematics and the Arts (JMA). Gary Greenfield is the editor and JMA will be published by Taylor and Francis of England. JMA is a peer-reviewed journal that focuses on connections between mathematics and the arts.

AIMS & SCOPE

The Journal of Mathematics and the Arts is a peer-reviewed journal that focuses on connections between mathematics and the arts. It publishes articles of interest for readers who are engaged in using mathematics in the creation of works of art, who seek to understand art arising from mathematical or scientific endeavors, or who strive to explore the mathematical implications of artistic works. The term ”art” is intended to include, but not be limited to, two and three dimensional visual art, architecture, drama (stage, screen, or television), prose, poetry, and music. The Journal welcomes mathematics and arts contributions where technology or electronic media serve as a primary means of expression or are integral in the analysis or synthesis of artistic works. The following list, while not exhaustive, indicates a range of topics that fall within the scope of the Journal:

• Artist’s descriptions providing mathematical context, analysis, or insight about their work.
• The exposition of mathematics intended for interdisciplinary mathematics and arts educators and classroom use.
• Mathematical techniques and methodologies of interest to practice-based artists.
• Critical analysis or insight concerning mathematics and art in historical and cultural settings.

The Journal also features exhibition reviews, book reviews, and correspondence relevant to mathematics and the arts.

NEWS

JOURNAL OF MATHEMATICS AND THE ARTS

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Papers for consideration should be sent to the Editor at the address below:
Gary Greenfield - Mathematics & Computer Science, University of Richmond, Richmond VA 23173, USA; Email: ggreenfi@richmond.edu.

For information, see www.tandf.co.uk/journals/titles/17513472.asp
On November 3, 2006, A Coxeter Colloquium was held at Princeton University, in honor of H.S.M. (Donald) Coxeter (1907-2003), who was considered the father of modern geometry. In particular, a dedication ceremony for John Conway’s 4-dimensional dodecahedron sculpture by Marc Pelletier took place at Quark Park. The sculpture is a copy of one that was presented by an anonymous donor to the Fields Mathematical Institute in Toronto to honor the 95th birthday of H.S.M. Coxeter in February, 2002. The same donor presented this sculpture to the Princeton University Mathematics Department in honor of Professor John H. Conway. An article by Ivars Peterson on Quark Park is at www.sciencenews.org/articles/20061111/mathtrek.asp

The schedule of the talks follows. Siobhan Roberts is the author of King of Infinite Space, a recent book on H.S.M. Coxeter. For a detailed summary of the Colloquium, see www.georgehart.com/CoxeterProgramme.pdf

Session One

J.R.Gott III, Welcome.

Siobhan Roberts on “Unfashionable Pursuits”, an excerpt from King of Infinite Space.

Freeman Dyson on “How Polyhedra Fit Into Each Other”

Michael Longuet-Higgins on “Snub Polyhedra and Organic Growth”

George Hart on “The Geometric Aesthetic”

Doris Schattschneider on “Coxeter and the Artists”

Marjorie Senechal on “Coxeter, the Verb”

Session Two.

Neil Sloane on “The Music of Quadratic Forms”

John Conway on “The Four Dimensional Polytopes”

Tony Robbin on “Coxeter, Hyper-tessellations, and Quasicrystals”

Marc Pelletier on “Coxeter’s Model Maker, Paul Donchian”

Roe Goodman on “Alice Through Looking Glass after Looking Glass”

J.R.Gott III on “Regular Skew Polyhedra and the Sponge-Like Topology of the Large Scale Structure of the Universe”

Siobhan Roberts on “Jeff Week’s Dodecahedral Universe”, a computer-animated excerpt from King of Infinite Space, with 3D glasses.

“Coxeter exhuming Geometry” by David Logotheti
Thank you much to Ergun Akleman for arranging for Texas A&M University, College Station, Texas to host ISAMA’07 at the College of Architecture, May 18-21. There will be a Proceedings with an electronic submission process and an exhibit. There is a hotel on campus, as well as dorm facilities. There is also an airport in College Station serviced by several airlines. Relevant information will be on the website http://archone.tamu.edu/isama07/

For four days Texas A&M will be Texas Arts and Mathematics!!

Joint Meeting of the MAA and AMS in New Orleans.

The annual joint meeting of the MAA and AMS will be held in New Orleans January 4-8, 2007. Fortunately, New Orleans is the home of the sculptor Arthur Silverman whose work is based on the tetrahedral form. Arthur has spoken at several of the Art-Mathematics conferences in Albany, Berkeley, and San Sebastian. Here is the announcement concerning Arthur’s talk and studio visit.

Arthur Silverman: Tetrahedral Variations.

Arthur Silverman graduated from Tulane Medical School in 1947 and pursued a highly successful career as a surgeon in New Orleans. He retired from his medical practice while in his fifties in order to concentrate on an earlier passion for sculpture. He was attracted to geometric sculpture and became infatuated with the tetrahedron. He has produced more than 300 sculptures based on the tetrahedron, predominately in stainless steel or aluminum (see www.artsilverman.com). His signature work is a pair of tetrahedrons, each 10 ft by 60 ft in front of the Energy Center in downtown New Orleans (see cover page). There are twenty of his sculptures in public buildings and outdoor areas in New Orleans. A map showing locations of the sculptures will be available at the Art Exhibit. Arthur Silverman will be giving a talk Tetrahedral Variations on Saturday at 6 pm at the Marriott. A studio visit is also being planned for Sunday at 6 pm. If you plan to visit the studio, please contact Nat Friedman: artmath@math.albany.edu

Mathematics and Culture


Bridges Donostia

Mucho congratulations to Reza for the tenth annual Bridges Conference, Bridges Donostia, to be held at the University of the Basque Country in San Sebastian, Spain, July 24-27, 2007. Donostia is the Basque name for San Sebastian. Javier Barrallo will be the main organizer in San Sebastian. Javier has already organized two wonderful conferences in San Sebastian. Namely Mathematics and Design in 1998 and ISAMA 99 in 1999. San Sebastian is a beautiful city on the northern coast of Spain in the Basque country. Dorm rooms with private bath will be available at a very reasonable cost that includes breakfast. There will be an excursion to Bilbao to see the Guggenheim Art Museum, as well as an excursion to Zabalaga, the sculpture park of Eduardo Chillida, outside San Sebastian. This conference will differ from the 1998 and 1999 conferences in that you will NOT have your own bottle of wine at lunch. Thus the afternoon sessions are expected to be better attended!! Alas, some conferencees will no doubt end up asleep on the beach. Watch the Bridges website for information.

Nexus V11, 2008

Nexus V11: Relationships between Architecture and Mathematics is organized by Kim Williams and will be held in June, 2008. For information, see www.nexusjournal.com
A work of art is initially a representation. It carries the mark of who has built it. It has a significance.

As a representation, a work of art can simply reveal a share of the intrinsic architecture of the universe. This revelation surprises and delights. It to some extent makes vibrate, as by resonance, the sensitive cords of the human being which, as a fragile and temporary result of the deployment of this universe, contains some of its fundamental elements, at least in its constitution. It attaches the being with the totality of nature, immerses it in this kind of ocean, which is protective and comforting. The work of art is equipped with an emotional capacity.

Mathematics as a whole is a representation of structural and constitutive data of our universe. It has, in an increasingly rich universe but detached also more and more of the immediate materiality, it becomes less and less accessible to the greatest number, which do not practice it. It has the appearance of a monster, cold and disconcerting by its high technicality.

However, it is possible to incarnate this universe symbolic system with the play of colors and matter to generate artistic forms that cause surprise, attract the glance, and arouse curiosity.

It is in this preoccupation with communication, exchange of ideas, and enrichment, which led me to a project where art would reveal parts of the mathematical world, and introduce mathematical ideas in a deferent, delicate, and subtle way. This led to the present exhibit that can be seen at http://hermay.org/ARPAM/palais-eau/index.html created by the painter Jean Constant. All the principal fields of geometry are represented: differential geometry with Patrice Jeener, François Apèry, Jean Constant, and John Sullivan; differential topology with the last three and Thomas Banchoff; dynamic topology with Michael Field; hyperbolic geometry with Irene Rousseau and David Wright; tessellations and polyhedrons with David Austin, Bill Casselman and George Binder; fractal geometry with Jean Francis Colonna and Nat Friedman. In addition there are the spheres of Dick Termes and graphics of Bahman Kalantari.


These two books are described at Amazon but there are only a few copies, which are expensive. Interlibrary loan is suggested.


Anna has attended many of our conferences. She is an architect in Salt Lake City, Utah. This book documents a large installation by Anna in the Cowles Mathematics Building at the University of Utah in Salt Lake City. The installation is multi media and covers three floors. It is a very impressive installation that combines many aspects of mathematics with art and architecture. This beautiful book is distributed by the American Mathematics Society, www.ams.org/bookstore.

COMMUNICATIONS

This section is for short communications such as recommendations for artist’s websites, links to articles, queries, answers, etc. For inclusion in HYPERSEEING, members of ISAMA are invited to email material for the categories outlined on the cover to hyperseeing@gmail.com or Nat Friedman at artmath@math.albany.edu.

A SAMPLE OF WEB RESOURCES

[1] www.kimwilliamsbooks.com
Kim Williams website for previous Nexus publications on architecture and mathematics.

Robert Fathauer’s website for art-math products including previous issues of Bridges.

The electronic journal Vismath, edited by Slavik Jablan, is a rich source of interesting articles, exhibits, and information.

A rich source of links to a variety of works. For inclusion in Hyperseeing, members of ISAMA are invited to email material for the categories outlined in the contents above to Nat Friedman at artmath@math.albany.edu

Kenneth Snelson’s website which is rich in information. In particular, the discussion in the section Structure and Tensegrity is excellent.

Bradford Hansen-Smith’s webpage on circle folding.

The new webpage of Bridges.

[8] www-viz.tamu.edu/faculty/ergun/research/topology
Topological mesh modeling page. You can download TopMod.

George Hart’s Webpage. One of the best resources.

[10] www.cs.berkeley.edu/
Carlo Sequin’s webpage on various subjects related to Art, Geometry ans Sculpture.

Geometry Junkyard: David Eppstein’s webpage anything about geometry.

Web Site for the International Symposium on Non-Photorealistic Animation and Rendering

Website of ACM Siggraph.

Image by Hernan Molina from Ergun Akleman’s Computer Aided Sculpting Course
CALL FOR PAPERS

Paper submissions are encouraged in Fields of Interest stated above. In particular, we specify the following and related topics that either explicitly or implicitly refer to mathematics: Painting, Drawing, Animation, Sculpture, Storytelling, Musical Analysis and Synthesis, Photography, Knitting and Weaving, Garment Design, Film Making, Dance and Visualization. Art forms may relate to topology, dynamical systems, algebra, differential equations, approximation theory, statistics, probability, graph theory, discrete math, fractals, chaos, generative and algorithmic methods, and visualization.

SUBMISSION

Authors are requested to submit papers in PDF format, not exceeding 5 MB. Papers should be set in ISAMA Conference Paper Format and should not exceed 10 pages. LaTeX and Word style files are available at: (will be available). Abstracts will not be reviewed. Abstract submission is just for the early identification of reviewers for papers. The papers will be published as the Proceedings of ISAMA’07.

FIELDS OF INTEREST

The focus of ISAMA’07 will include the following fields related to mathematics: Architecture, Computer Design and Fabrication in the Arts and Architecture, Geometric Art, Mathematical Visualization, Music, Origami, and Tessellations and Tilings. These fields include graphics interaction, CAD systems, algorithms, fractals, and graphics within mathematical software. There will also be associated teacher workshops.

ISAMA’07 will be held at Texas A&M University, College of Architecture, in College Station, Texas. The purpose of ISAMA’07 is to provide a forum for the dissemination of new mathematical ideas related to the arts and architecture. We welcome teachers, artists, mathematicians, architects, scientists, and engineers, as well as all other interested persons. As in previous conferences, the objective is to share information and discuss common interests. We have seen that new ideas and partnerships emerge which can enrich interdisciplinary research and education.

For four days

Texas A&M will be

Texas Arts and Mathematics!!
IMPORTANT DATES
December 15, 2006  Submission System Open
January 15, 2007  Paper and Short paper submission deadline
February 15, 2007  Notification of acceptance or Rejection
March 15, 2007  Deadline for camera-ready copies

RELATED EVENTS
Art & Architecture Exhibition
There will be an exhibit whose general objective is to show the usage of mathematics in creating art and architecture. Instructions on how to participate will be posted on the conference website.

Teacher Workshops
There will be teacher workshops whose objective is to demonstrate methods for teaching mathematics using related art forms. Instructions on how to participate will be posted on the conference website.

HISTORY
The International Society of the Arts, Mathematics, and Architecture (ISAMA) was founded in 1998 by Nat Friedman, sculptor and professor of mathematics at SUNY Albany, as an outgrowth of his series of conferences on Art and Mathematics, held in Albany from 1992 through 1997, and in Berkeley in 1998.

PREVIOUS ISAMA CONFERENCES
ISAMA’04, DePaul University, Chicago Illinois
ISAMA’03, University of Granada, Granada, Spain
ISAMA’02, University of Freiburg, Freiburg, Germany
ISAMA’00, SUNY-Albany, Albany, NewYork
ISAMA’99, University of the Basque Country, San Sebastian, Spain
Previous Conferences on Art and Mathematics (AM)
AM’98, University of California, Berkeley, California
AM’92-AM’97, SUNY-Albany, Albany, NewYork
For additional ISAMA information, see www.isama.org. In particular, the Directory is a rich source of links to works in a variety of fields.

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International Society of the Arts, Mathematics, and Architecture

An illustration by Ergun Akleman, Inspired by Robert Kauffmann’s “One Sided Relationship”. The 3D Escher inspired Moebius Strip is created by Avneet Kaur in Computer Aided Sculpting course of Ergun Akleman.